Climate Change and Cape Cod: Coastal Impacts and Adaptation Strategies

Adapting to Climate Change:
Planning Approaches and Resources

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West Yarmouth, MA
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Plan

1. Define Adaptation and why it is important to consider
2. Ideas on where and how to incorporate climate change info into planning
3. Available tools and various Adaptation Plans
4. Developing tools and an Adaptation Network/Heinz Center Pilot project
Part 1

Define Adaptation and why it is important to consider

Where and how to incorporate climate change info into long-term planning

Available Tools and various Adaptation Plans

Developing tools and an Adaptation Network/ Heinz Center Pilot project
Adaptation: Notes

- Adjustments to reduce vulnerability: increase resilience/ better planning
- Mitigation: reduce emissions of GHG
- Adaptive capacity uneven w/in and across society: resources (poor communities/money, expertise, appropriate use of knowledge), political will, policies/regulations, not automatically translate into reduced vulnerability (e.g. New Orleans)
- Rarely only because of climate change: multiple stressors; hazard management
- Location and issue specific: locations vary so issues will vary
- Scale of information needs to match scale of issue
New York-New England

Annual Precipitation
Regional Weighted Change
+3.7% (1895-1999)

Figure: US National Assessment Overview pg 40
Scale matters: region size and info

**FIGURE 2.6**
New England and New York annual precipitation changes (%) between 1895 and 1999. The faint lines within each state represent NCDC climate zones.

Source: New England Regional Assessment
Why is Adaptation important?

• The future will be different than the past
  Infrastructure and natural resource management of past will be wrong; tolerances of design and species will be exceeded.

• We are already committed to more change
  Greenhouse gases have long lifetimes.

• It is more than the averages . . .
  Regional/ local variability; extremes; seasonal

• Amount of warming makes a difference
  Mitigation is critical but it is a slow process
Part 2

Define Adaptation and why it is important to consider
Ideas on where and how to incorporate climate change info into planning (what can one town do?)
Available Tools and various Adaptation Plans
Developing tools and an Adaptation Network/ Heinz Center Pilot project
Context

Climate Change
not the only challenge
to be juggled
Competition for Resources and Attention

**Elderly:** pensions, social security, health care

**Economy:** globalization; diminishing personal resources

**Energy:** more vulnerable, more costly

**Environment:** other issues of pollution and land/water conservation
Towns have:

A lot to lose from climate impacts: sea-level rise, storms, water problems, potential health impacts, forest fires, etc.

Limited resources and tight budgets

Much to gain from opportunities: economic development, energy savings, avoided costs

Relevant authorities: building and development permits (influence land use); building codes; public transit

Opportunity to learn from and work with other communities

Can be leaders and call for support and leadership from the State
Guilford’s Climate Change Resolution

February 5, 2007

The Board of Selectman resolves that the Gov’t of the Town of Guilford recognize Climate Change as a phenomenon requiring long term governmental monitoring and mgt . . . Directs town depts and recommends Boards and Commissions formally consider the impacts . . . on planning, management, procurement and budgetary decisions and regulations re: greenhouse gas emissions and negative impacts . . .
Adaptation planning: many timeframes

Timeline source: Linda Mearns, NRC, Oct 25, 2007
Adaptation options include: management, technology, institutions, monitoring, R & D

- Prioritize lands to preserve
- Design of migration corridors
- Emergency response plans
- Early warning alert systems / surveillance
- Infrastructure to withstand new “extremes”
- Linking of reservoirs to enhance supply
- Seed banks, mass propagation techniques
- Incentives / disincentives / insurance

Source: R. Bierbaum, Coping with Climate Change: National Summit, May 8-10, 2007
Adaptation Considerations

• What are the costs? Who pays?

• Unintended and unexpected consequences

• Relationships of adaptations in different sectors

• Relationship between adaptation and mitigation

• Who:
  individuals, municipalities, states, regions, nations
Ways to Think About Options

Trends: from models and observations

Vulnerability assessment

Scenario building

Hazard planning

What ifs/how much
Combined Wastewater Systems

Source: US National Assessment Overview Document
Rhode Island/ CSO

- Overflowed: .5” rain-> raw sewage to Bay contaminated shellfish and beaches

- Adaptive Action:
  Digging 3 massive tunnels: 170-280 ft
  $467 million/20 years

- Should contain 98% of waste water
Part 3

Define Adaptation and why it is important to consider ideas on where and how to incorporate climate change info into planning.

Available Tools and various Adaptation Plans

Developing tools and an Adaptation Network/Heinz Center Pilot project.
A Survey of Climate Change Adaptation Planning

Bill Perkins
Dennis Ojima
Assessment Approach: 8 Criteria

1. Useful to different levels of government, environmental issues
2. Enough detail for policy development
3. Include a decision-making framework
4. Describe a method to assess sensitivity, adaptive capacity, vulnerability
5. Include sample adaptive actions
6. Address implementation
7. Provide links to additional resources
8. Encourage stakeholder participation
Guidebooks and Frameworks
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<th>TCLEI</th>
<th>C-CARN</th>
<th>Tyndall Centre</th>
<th>Australian Government</th>
<th>International Renewable Energy Agency</th>
<th>UNEP</th>
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**Legend:**
- ✔️ ✔️ discussed in depth
- ✔️ discussed in some detail
- none -- very little detail or not discussed
ICLEI – King County - CIG

“Preparing for Climate Change: A Guidebook for Local, Regional and State Governments” (2007 projected)

- Local and regional governments
- Detailed “tactical” guidance
- Many additional resources
Clean Air Partnership


- Case-study book
- Provides lessons learned
- Emphasizes:
  - Leadership
  - Stakeholders
  - Resources
C-CIARN


• Introduction

• 6 case studies of adaptation planning
  – Toronto’s Heat Alert System
Tyndall Centre
“Surviving Climate Change on Small Islands: A Guidebook” (2005)

- Broadly applicable
- Detailed implementation
- Extremely useful
Australian Greenhouse Office


- Vulnerability assessment framework
- Decision-making techniques
Additional Guidebook

“Planning for Climate Change: A Handbook for City, Town and Rural Area Planners”
by Scott Shuford
Collaboration Initiatives

Climate Resilient Communities

Urban Leaders Adaptation Initiative
Deer Island Wastewater treatment plant:
Built 1990s higher elevation, higher cost to accommodate rising sea levels.

Other issues: bridge scour, energy demand, public health, flooding, buildings, water quality, water supply, transportation.

Source: Heinz Center report: A survey of Climate Change Adaptation Planning
San Francisco Bay

Impacts of climate change on fresh water inflow

Other issues: flooding, sea level rise, extreme weather events

SLR maps -> 200 sq mi inundate $100 billion

Impact studies and partnerships w/agencies

Source: Heinz Center report: A survey of Climate Change Adaptation Planning

Image Source: San Francisco Bay Conservation and Development Commission
Chicago

- **Stage:** preliminary
- **Impacts:**
  - Aviation
  - Buildings
  - Energy demand
  - Lake level decrease
  - Public health
  - Transportation
  - Water supply
Homer, AK

- **Stage:** preliminary
- **Impacts:**
  - Extreme weather events
  - Ocean acidification
  - Sea-level rise
  - Warming oceans
  - Water supply
  - Wildfire risks
King County, WA

- Stage: complete
- Impacts:
  - Biodiversity and ecosystems
  - Buildings
  - Climate science
  - Economic impacts
  - Land use
  - Public health
  - Safety and emergency preparedness
  - Surface water management
  - Transportation
  - Water quality
  - Water supply
Miami-Dade County

- Stage: preliminary
- Impacts:
  - Agriculture and fisheries
  - Flooding
  - Loss of tourism
  - Public health
  - Sea-level rise
  - Temperature increases
  - Water supply
  - Wetlands
New York City

• Stage: sustainability plan
• Impacts:
  – Air quality
  – Flooding
  – Heat islands
  – Temperature increases
  – Sea-level rise

Image Source: “PlaNYC: A Greener, Greater New York” (April 2007)
Part 4

Define Adaptation and why it is important to consider

Ideas on where and how to incorporate climate change info into planning

Available Tools and various Adaptation Plans

Developing tools and an Adaptation Network/Heinz Center Pilot project
Developing Tools

1. Index of impacts & options
   * Searchable list of issues: back of survey
   * Will be built upon by AN

2. Downscaling of GCM data

3. Decision Support Cascade: pilots
Norway Temperatures depicted in GCM for 2075

Increases in Temperatures per decade from a 1964-1990 base to 2020-2049

Note the dramatic increase in the detail and texture of the temperature distributions with the downscaling

Downscaled Image

Source: NMI
Develop a 25-40 year Adaptation Plan

Frame the Problem

Set the Context and Scale (cities, water, etc.)

Set Time Scale

Frame the Context and Scale (cities, water, etc.)

4 Quad Scenarios

Downscale Key Parameters at needed Scale

Downscale Key Parameters with Drivers

Develop the 4 Quad Scenarios with Drivers

Track Progress

Key Tracking Indicators and Evaluate Progress

Adaptation Assessment Cascade

A methodology to craft long-term (i.e., 25-40 years) continuously updatable adaptation assessment/plans focused on climate change including exacerbating stresses.
Governance and Policy Actions

Socio-Environmental Processes

Processes Respond Rapidly

“Lots” of Luck Scenario
1. Scenario Details
2.
3.
. .
n
Processes Respond very Slowly

Aggressive Policy Action

Weak to Little Policy Action

“Get with it” Scenario
1. Scenario Details
2.
3.
. .
n
“Well just Delay” Scenario
1. Scenario Details
2.
3.
. .
n
Easy Street Scenario
1. Scenario Details
2.
3.
. .
n
4 Quad Scenario Framework

These Processes Respond very Slowly
Develop a 25-40 year Adaptation Plan

Controlling Projections

Tease out Key Projections with Multi-Stresses

4 Quad Scenarios

Downscale Key Parameters at needed Scale

Develop the 4 Quad Scenarios with Drivers

Set Time Scale

Set the Time Scales via Climate Conditions

Downscale Key Parameters

Frame the Context and Scale (cities, water, etc.)

Frame the Problem

Design and Implement Adaptation Plan

Track Key Tracking Indicators and Evaluate Progress

Progress

Adaptation Assessment Cascade

A methodology to craft long-term (i.e., 25-40 years) continuously up-datable adaptation assessment/plans focused on climate change including exacerbating stresses.
Adaptation Planning Pilot Study: 2008 Interested?

- Adaptation Network with the Heinz Center
- Working with downscaling information
- Cascade approach of multiple steps to move from impact assessment to adaptation plan implementation
- Contact: Lynne Carter, lcarter231@aol.com
Documents Available

Heinz Survey and King Co/ICLEI

adaptationnetwork.org
Adaptation: Planned or Reactive?

We can plan ahead

OR

We can react

Photos: courtesy of Joel Scheraga, EPA
Contact Info

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www.adaptationnetwork.org